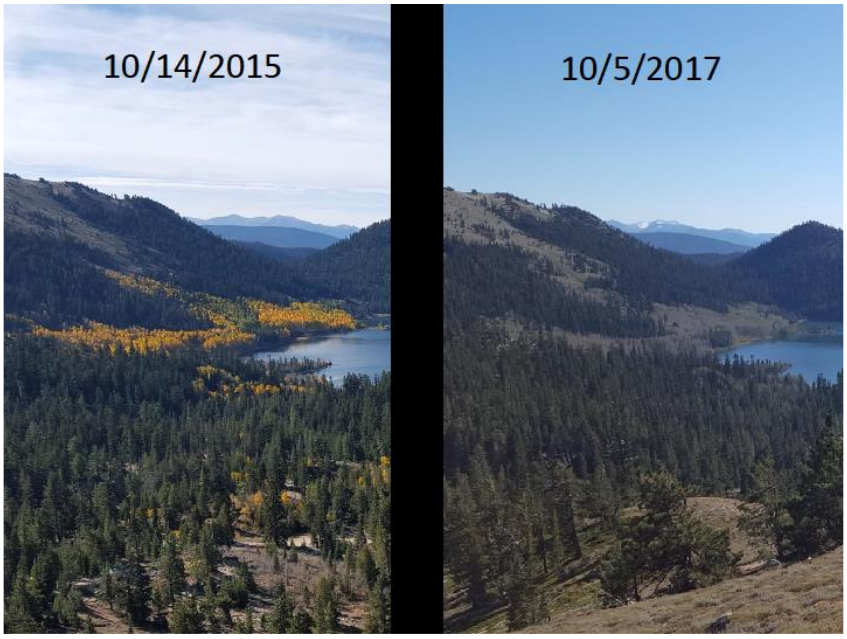
United States
Department
Of Agriculture
Forest Service
State and Private
Forestry
Forest Health Protection
Intermountain Region
R4-OFO-PR 18-01
State of Nevada

Nevada
Division of Forestry
Department of
Conservation and Natural
Resources

2017 Forest Pest Conditions In Nevada



White Satin Moth Damage Comparison
Marlette Lake, Nevada
(Photos: Mark Enders)

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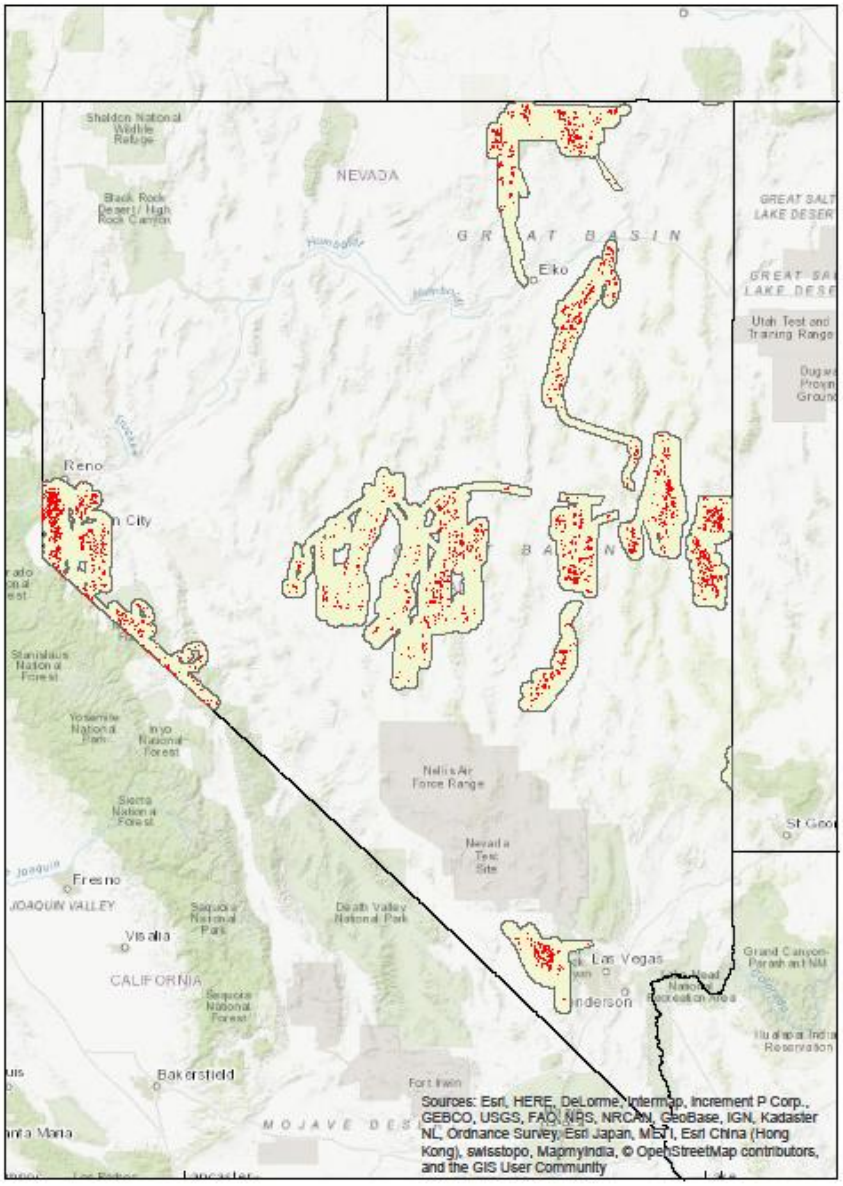
Figure 1 - 2017 Aerial Survey Map



INTRODUCTION AND SUMMARY

In an effort to simplify discussions of forest health conditions in Nevada, this report focuses on only insects, diseases, and weather factors that impacted various tree species in the State. Data collected through aerial detection surveys (ADS) conducted by the USDA Forest Service and Nevada Division of Forestry are primarily used to determine mortality trends in the State from year to year. Mortality trends are described in terms of acres affected; however, not all trees on these acres are dead. Not all forested lands are surveyed, and not all of the same acres are surveyed every year. Sometimes, tree mortality may be counted in the same area in consecutive years. This can lead to inflated estimates of actual tree mortality. Total acres tallied may also change between years due to increases or decreases in the total number of acres surveyed. Consequently, interpretation of ADS data should consider these sources of inconsistency. The ADS data encompasses most of the Humboldt-Toiyabe National Forest including portions of the Bridgeport and Carson Ranger Districts located in California. A smaller percentage of acreage was surveyed to obtain data for Great Basin National Park, other federal lands, State lands, and private lands (Table 1).

TABLE1. TOTAL NUMBER OF ACRES SURVEYED IN EACH OF THE OWNERSHIP CATEGORIES FOR THE YEARS 2009 TO 2016

Table 1. Total number of acres surveyed in each of the ownership categories for the years 2010-2017.

Land Ownership/ Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
NF H-T (NV)	4,340,0053	4,008,334	4,011,229	3,340,095	4,429,990	4,916,969	5,329,221	5,239,810
NF H-T (CA)	595,850	582,933	582,933	685,252	595,007	625,488	570,641	575,908
BLM	2,299,901	1,937,082	1,892,996	1,013,172	1,483,353	1,597,815	2,742,127	3,168,492
Private (NV)	360,865	519,280	306,606	148,504	391,378	397,047	921,482	834,150
Private (CA within NF)	32,335	41,528	29,846	60,155	70,501	32,977	32,830	30,088
Great Basin NP	76,890	75,604	75,604	76,959	77,021	77,078	77,099	77,000
Other Federal*	1007	33,228	33,228	6,466	5,124	3,719	80,120	114,275
NV State Lands	20,579	20,105	17,163	148,504	21,848	19,889	20,470	13,935
TOTAL	7,727,480	7,218,094	6,949,605	5,479,107	7,074,222	7,670,982	9,773,990	10,053,658

*Includes United States Fish and Wildlife Service, Department of Defense, Bureau of Indian Affairs, and other tribal lands

Long term insect trend data summarizes activity detected on all surveyed ownerships in NV. However, the discussions of activity for individual insect and disease agents detected in 2016 are Nevada only and summarized on a county basis. The total number of acres in each county and the percentage of acres surveyed during 2016 are provided in Table 2.

TABLE 2 NUMBER AND PERCENTAGES OF ACRES SURVEYED IN NEVADA COUNTIES IN 2017

COUNTY	COUNTY ACRES	ACRES SURVEYED	PERCENT SURVEYED
Carson City	103,569	90,875	87.7
Churchill	3,215,911	989	0.0
Clark	5,176,177	448,016	8.6
Douglas	478,351	393,449	82.3
Elko	10,979,963	1,578,348	14.4
Esmeralda	2,294,165	0	0.0
Eureka	2,663,738	294,964	11.1
Humboldt	6,219,557	0	0.0
Lander	3,534,543	568,749	16.1
Lincoln	6,782,623	101,349	1.5
Lyon	1,310,315	262,652	20.0
Mineral	2,462,989	237,624	10.0
Nye	11,686,348	2,830,321	24.2
Storey	167,774	77,166	46.0
Washoe	4,234,009	219,267	5.2
White Pine	5,676,727	1,959,520	34.5
Total	66,986,759	9,063,289	13.5

In 2016, FHP changed the quantification methodology from “trees per acre” to “percent of trees affected” for polygons with insect and disease damage. Small areas are still recorded as points. A five level classification system is used to describe damage levels. Damage is recorded as a point, polygon, or grid cell feature and one causal agent is assigned to each feature. Depending upon feature type, the intensity of the damage is recorded differently. For point data, trees affected are classified into one of 5 levels that correspond to the number of trees killed associated with each point. For a polygon or grid cell data, the percentage of trees affected within each polygon or grid cell is classified into one of 5 levels for each polygon or grid cell associated with all trees within the polygon or grid cell data as estimated by the observer.

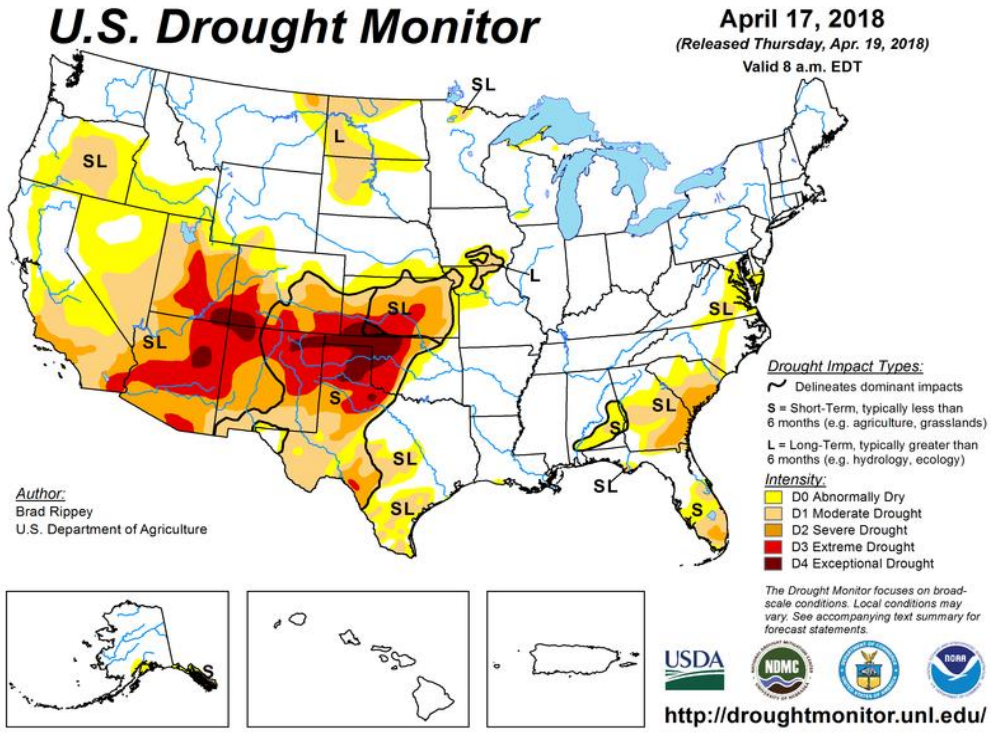
TABLE 3 THE 5 LEVEL CLASSIFICATION SYSTEM USED TO DESCRIBE DAMAGE LEVELS IN 2017

Point Class	Trees Affected		Polygon or Grid Cell Class	Percent Trees Affected
1	1		1	1 to 3%
2	2 to 5		2	4 to 10%
3	6 to 15		3	11 to 20%
4	16 to 30		4	21 to 50%
5	>30		5	>50%

The winter of 2016-2017, in Nevada was an excellent winter with above normal precipitation statewide with heavy snow loads and flooding. Drought conditions were removed from the entire state, with only some abnormally dry conditions being present in the south portion of the state. The

winter of 2017-2018 has been abnormally dry (Figure 1). The palmer Drought Stress Index shows Nevada being abnormally dry, however no drought conditions are reported as of the time of writing this report and looks to improve through the spring of 2018 (Figure 2).

Figure 1- US Drought Monitor Map for February, 2018



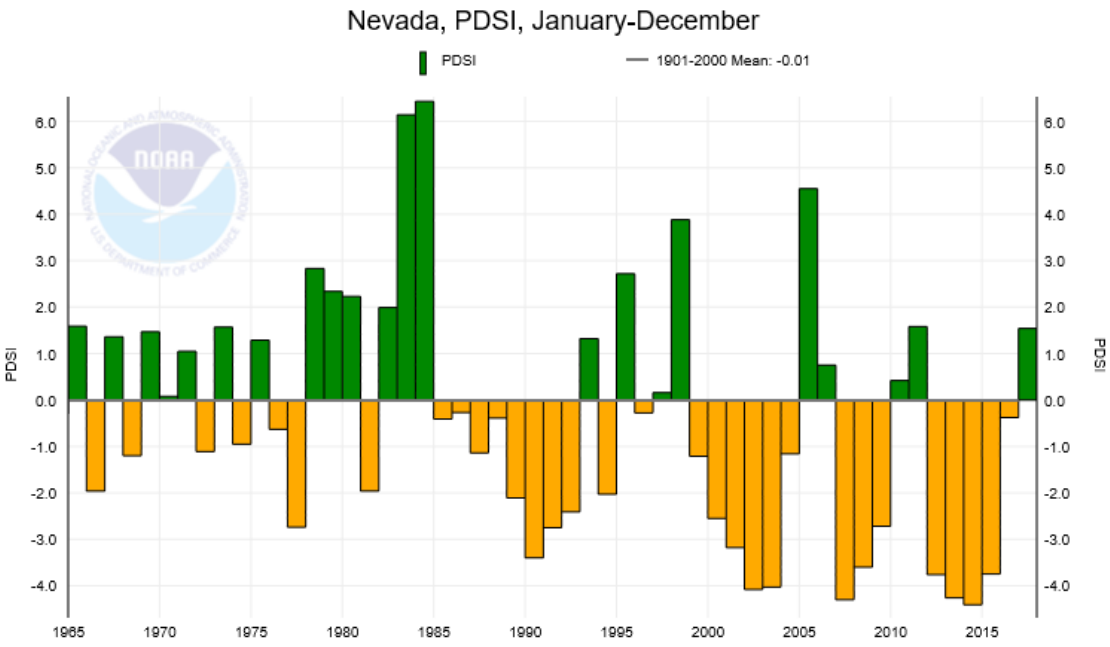


Figure 2 - National Oceanic and Atmospheric Administration (NOAA) Nevada Palmer Drought Severity Index – January - December Precipitation from 1965-2017 (National Climate Data Center).

In 2017, the amount of insect and disease caused mortality increased slightly with damage being recorded on 13,925 acres. This increase may be attributed to several factors. Factors include, but are not limited to, the natural population trends of insects over the course of time given the increase in predatory and secondary insect post outbreaks.

The majority of the tree mortality noted in 2017 is attributed to aspen decline/dieback and to insect activity. Acres affected were largely dominated by pinyon engraver, mountain pine beetle and fir engraver beetle, followed by pinyon needle scale, root disease, and bark beetle complexes. It should be noted that some bark beetle-killed trees are not typically symptomatic (faded foliage) until one year following the year of attack. Therefore, the numbers of acres affected and trees killed by bark beetles, as recorded during ADS flights, are typically a reflection of the previous year's or earlier attacks. Levels of defoliation, however, may reflect either the activity of an insect or disease during the current year or activity since bud break.

In 2017, Nevada tree mortality (number of trees killed) caused by most insects and diseases increased for the first time since 2014. Mountain pine beetle in lodgepole, whitebark, white, and limber pine increased to 2,327 acres. Fir engraver beetle mortality, increased to 2083 acres up from 431 acres in 2016.

In 2017, acres affected by defoliators increased. Pinyon needle scale increased in 2017 with 1,511 acres damaged, up from a total of 68 acres in 2016. Pinyon sawfly, and Douglas-fir tussock moth were not detected in 2017 with no damaged acres recorded. Forest tent caterpillar was not detected in 2017. White satin moth infestations increased mainly in Washoe County. White satin mothwere also recorded in Carson City, Douglas, Elko, Humboldt, and Lander counties. A total of 350 acres was recorded with 226 acres causing heavy defoliation in Lake Tahoe Nevada State Park.

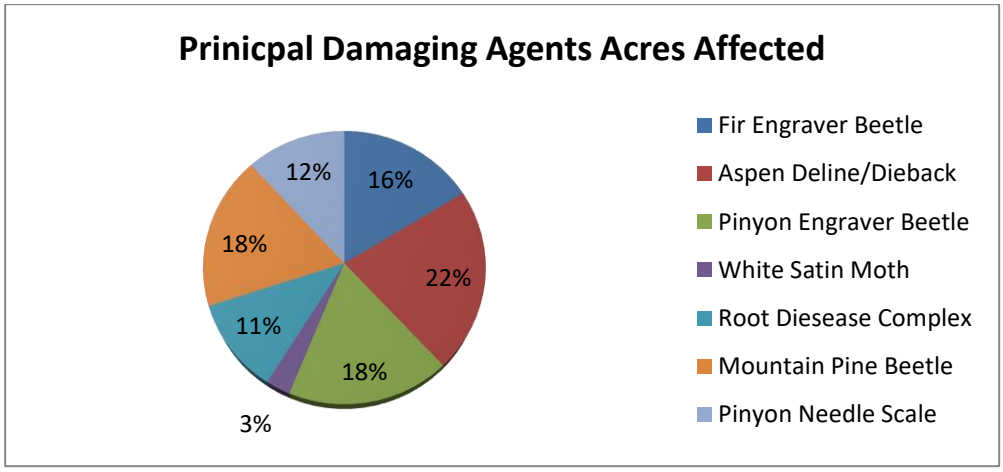


Figure 3 – Grahpic representation of the acres affected in Nevada by the main mortality and defoliation agents aerially mapped in 2017.

For additional information on forest insect and disease conditions and maps see:
http://foresthealth.fs.usda.gov/portal
and
http://forestry.nv.gov/forestry-resources/forest-health/

NOXIOUS WEEDS

Noxious weed species are widespread throughout Nevada. Nevada Department of Agriculture (NDOA) monitors and oversees Nevada's weed laws. Their main website for weed status, information, contacts, is:
http://agri.nv.gov/PLANT_NoxWeeds_index.htm
Below is NDOA's listing of Noxious Weeds in Nevada by Category A, B or C: Table 4.

Common Name	Scientific Name
Category A Weeds:	
African Rue	Peganum harmala
Austrian fieldcress	Rorippa austriaca
Austrian peaweed	Sphaerophysa salsula / Swainsona salsula
Black henbane	Hyoscyamus niger
Camelthorn	Alhagi camelorum
Common crupina	Crupina vulgaris
Dalmation Toadflax	Linaria dalmatica
Dyer's woad	Isatis tinctoria
Eurasian water-milfoil	Myriophyllum spicatum
Giant Reed	Arundo donax
Giant Salvinia	Salvinia molesta
Goats rue	Galega officinalis
Green Fountain grass	Pennisetum setaceum
Houndstongue	Cynoglossum officinale
Hydrilla	Hydrilla verticillata
Iberian Starthistle	Centaurea iberica
Klamath weed	Hypericum perforatum
Malta Star thistle	Centaurea melitensis
Mayweed chamomile	Anthemis cotula
Mediterranean sage	Salvia aethiopis
Purple loosestrife	Lythrum salicaria, L.virgatum and their cultivars
Purple Star thistle	Centaurea calcitrapa
Rush skeletonweed	Chondrilla juncea
Sow Thistle	Sonchus arvensis
Spotted Knapweed	Centaurea masculosa
Squarrose knapweed	Centaurea virgata
Sulfur cinquefoil	Potentilla recta
Syrian Bean Caper	Zygophyllum fabago
Yellow Starthistle	Centaurea solstiltialis
Yellow Toadflax	Linaria vulgaris
Category B Weeds:	
Carolina Horse-nettle	Solanum carolinense
Diffuse Knapweed	Centaurea diffusa

Leafy spurge	Euphorbia esula
Medusahead	Taeniatherum caput-medusae
Musk Thistle	Carduus nutans
Russian Knapweed	Acroptilon repens
Sahara Mustard	Brassica tournefortii
Scotch Thistle	Onopordum acanthium
White Horse-nettle	Solanum elaeagnifolium
Category C Weeds:	
Canada Thistle	Cirsium arvense
Hoary cress	Cardaria draba
Johnson grass	Sorghum halepense
Perennial pepperweed	Lepidium latifolium
Poison Hemlock	Conium maculatum
Puncture vine	Tribulus terrestris
Salt cedar (tamarisk)	Tamarix spp
Water Hemlock	Cicuta maculata

INSECTS: NATIVE

DEFOLIATORS

Douglas-fir Tussock Moth
Orgyia pseudotsugata

Hosts: All true firs and spruce

The Douglas-fir tussock moth (DFTM) is an important native insect capable of causing significant defoliation of subalpine fir in Nevada. Heavy defoliation causes reduced growth, stress, and tree mortality. Heavy defoliation can cause top kill and mortality of advanced regeneration during a single season. Outbreaks are cyclic, usually appearing quickly followed by an abrupt decline within a one to four year period.

Figure 4 - Douglas-fir tussock moth larvae.

No DFTM defoliation detected during aerial surveys in 2017, and no moths were trapped in 2017.

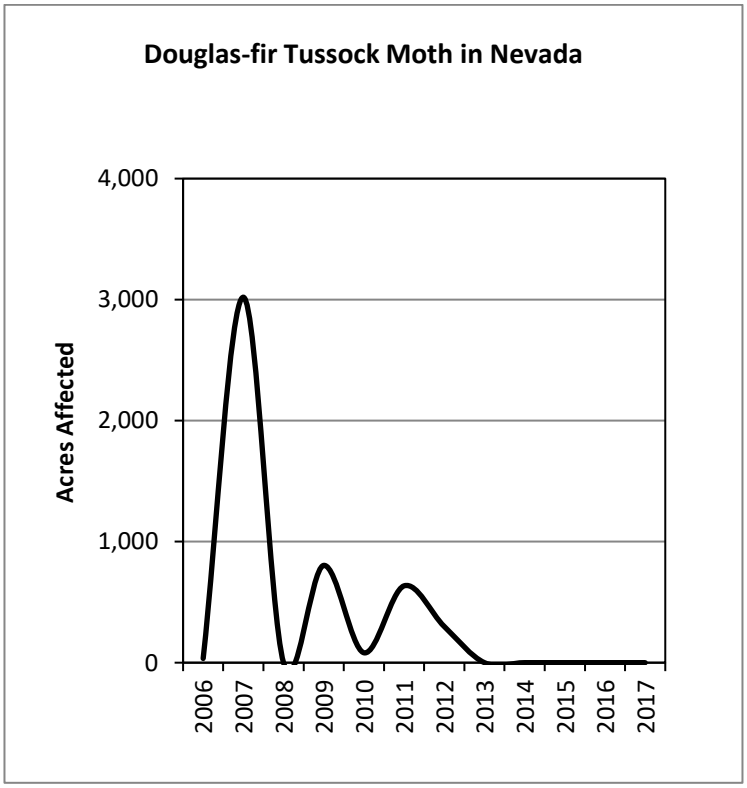


Figure 5 - Acres with Douglas-fir tussock moth defoliation in Nevada from 2006-2017.

Pinyon Sawfly
Neodiprion edulicolus

Host: pinyon pine

The pinyon sawfly is an important native insect capable of causing significant defoliation, but usually goes undetected because it occurs in small numbers and causes little damage. However, heavy defoliation causes reduced growth, stress, and tree mortality. Thin crowns add a ghostly, transparent appearance to the forest canopy. In some locations, sawfly outbreaks are occurring in conjunction with pinyon needle scale (*Matsucoccus acalyptus)* defoliation.

In 2017, no sawfly damage was detected in the aerial detection survey. That does not mean that isolated outbreaks did not occur, they were just not captured during the annual survey. Defoliator activity is cyclical in nature and will likely pick back up in the future.

Pinyon Needle Scale
Matsucoccus acalyptus

Host: pinyon pine

The pinyon needle scale (PNS) is a sap-sucking insect that feeds on two year old needles. Foliage of infested trees turns yellow then brown. Heavy defoliation causes reduced growth, stress, and tree mortality. Past outbreaks have been recorded as far back as 1959 throughout Nevada, causing localized defoliation and mortality of some trees. Historic outbreaks have been noted between 1963-2011 in Nevada and southwest Utah, affecting several hundred thousand acres. In 2017 1,511 acres of pinyon scale infestation were mapped in NV. This minimal amount of damage is likely due to pinyon being re-foliated due to excellent winter and spring moisture in 2016-2017. Much of the mapped area was also affected by a combination of secondary insects such as twig beetles (*Pityophthorus spp., Pityogenes spp*.). From the air, the damage caused by these other insects is similar in appearance to that of PNS infestation, and some areas will be dominated by one or a mixture of these insects. Consequently, differentiating damage attributed to these various causal agents can be extremely difficult, and therefore are all mapped as PNS.

Carson City County–280 acres were detected on the low elevations at the far north end of the Pine Nut range**.**
Douglas County – 227 acres were detected in the lower elevations of the Pine Nut Range.
Lyon County – 88 acres were detected in the foothills of the Pine Nut Range**.**
Nye County – 105 acres were detected in all elevations in the Monitor and Toiyabe Ranges**.**
Storey County – 221 acres were detected throughout the Virginia Range.
White Pine County – 68 acres were detected throughout all elevations of the Egan, duck Creek and Snake Ranges.

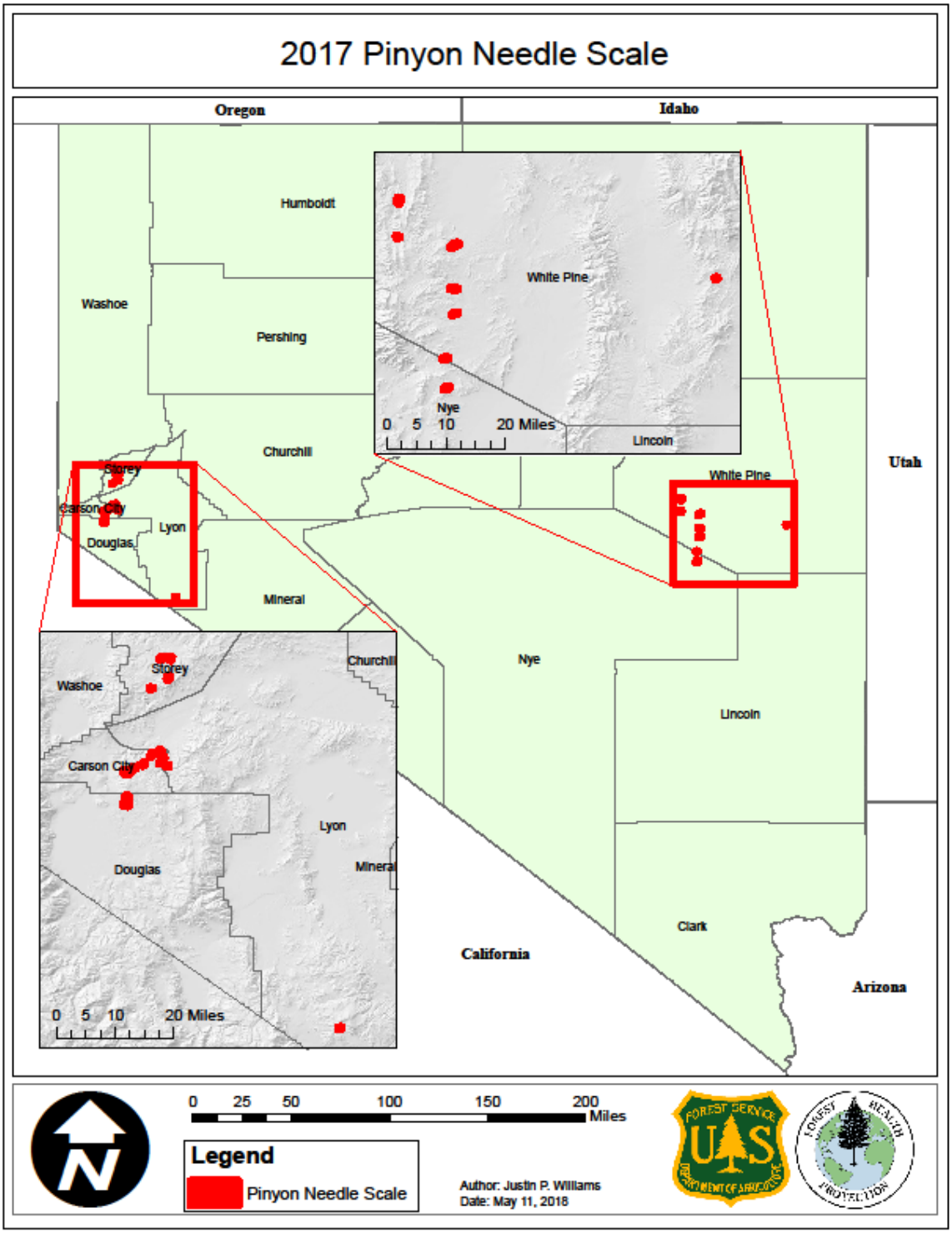


Figure 6 – Pinyon Needle Sale Damage in Nevada 2017

Forest Tent Caterpillar
Malacosoma disstria

Hosts: aspen, birch, oak, some maples, and other deciduous species

The forest tent caterpillar (FTC) is a native defoliator of aspen. Overwintering takes place as a fully developed embryo inside the egg shell. When they hatch in the spring, the larvae tend to migrate high in the tree where they feed on expanding flower and leaf buds. After bud break, larvae feed on the foliage, being most gregarious in their early life stages. The adult is a tan moth about 4 cm long with two dark brown, oblique stripes on each forewing. The caterpillar (the most often seen life stage) is mostly dark blue with wavy reddish brown lines and distinct white, keyhole-shaped markings down the back. Larvae feed in groups without making any webbing. (Western Tent Caterpillar makes the large webs found on chokecherry and are reddish brown caterpillars). Flight and mating activities begin late afternoon through most of the night. There is one generation each year. Parasites tend to keep the outbreaks of this insect cyclic and in check over time. In 2017, no FTC defoliation was observed during on the ground or aerial surveys.

Western spruce Budworm
Choristoneura occidentalis

Hosts: Douglas-fir, all true firs, spruce, and pines on occasion

The western spruce budworm is a native defoliator of true firs, Douglas-fir and spruce. Look for larvae in silken nests of webbed, chewed needles from June through August. Larvae are seen in spring and early summer and fist mine buds and old needles then consume new foliage as it appears. Mature larvae have brown heads and bodies with prominent ivory-colored spots. They can be an inch long when fully grown. Adults are mottled-rust brown and have a wingspan of approximately seven-eighths of an inch. Female moths lay eggs on needles in a shingle-like pattern usually in August. Larvae hatch and immediately seek a sheltered location to overwinter.

White Pine County – 154 acres was detected within Great Basin National Park. All the defoliation was found mid-slope on the northeast flank of Wheeler Peak. Damage was mainly observed on douglas-fir and some small pockets of Engelmann spruce.

INSECTS NATIVE

Bark Beetles

Fir Engraver Beetle
Scolytus ventralis

Hosts: true firs

In 2017 mortality increased to 2,083 acres, up from 431 acres in 2016. This is an increase of 480% in acres detected in 2016. However, even though this percentage increase sounds high it is still a relatively small number of acres statewide. Nye, Washoe, and White Pine County had the largest increases of FEB in stands heavily dominated by true firs.

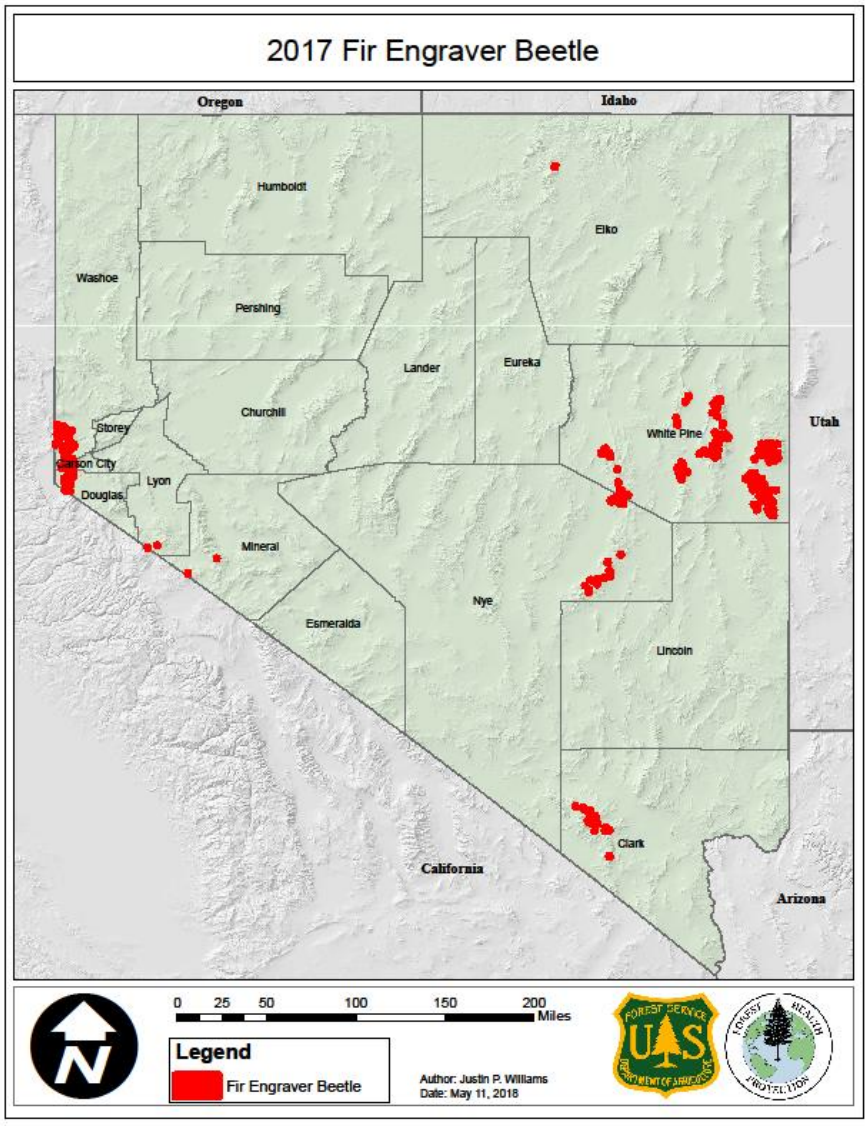


Figure 7 – Fir Engraver Mortality in Nevada in 2017

Carson City – Mortality was observed on 40 acres, all within the Carson Range.
Clark County- 2017 mortality was observed on 86 acres. This was a 50% decrease from 2016 and damage was located in Lee and Kyle Canyon which is north and east of Mount Charleston.
Douglas County – Mortality was observed on 128 acres located mainly in the Carson Range.
Elko County – Mortality was observed on 34 acres located in the Jarbridge, and Ruby Mountains.
Nye County – Mortality occurred 234 acres located mainly in the Grant, Hot Creek and Monitor Ranges.
Washoe County – Mortality was observed on 346 acres. Damage is located all along the Sierra Front Range, with pockets of 5 acres or less within the Mt. Rose Wilderness Area.
White Pine County – Mortality in White Pine County increased to 1,202 acres in 2017. Mapped activity is found in pockets that range in size from one to 10 acres and were mainly located in the White Pine, Schell Creek, Egan, and Snake Ranges.

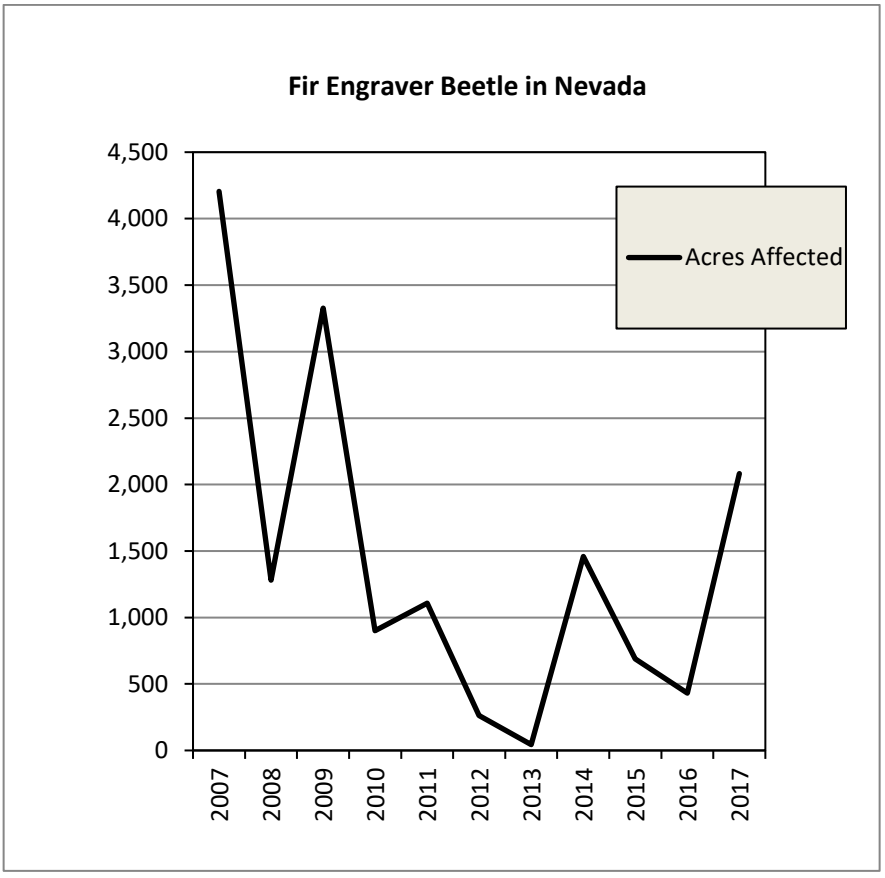


Figure 8 - Fir engraver mortality in Nevada 2007 - 2017

Jeffrey Pine Beetle
Dendroctonus jeffreyi

Host: Jeffrey pine

The Jeffrey pine beetle is the most destructive bark beetle of Jeffrey pine. Endemic populations usually attack scattered, slower growing, mature and over-mature trees and trees struck by lightning. In Nevada, Jeffrey pine is only found naturally along the Sierra Nevada Mountains. Mortality decreased in 2017 to 146 acres as compared to 686 acres observed in 2016. The area northwest of Incline Village, north of Crystal Bay still has pockets of 1 to 2 acres but has substantially decreased the last two years. Jeffrey pine is also being killed by *Ips pini* in combination with roundhead and flathead woodborers. California flathead woodborer is also found as the main mortality agent on Jeffrey pine along the eastern front of the Carson Range in western Nevada.

Figure 9 - Jeffrey pine beetle-caused tree mortality in Alpine county in California along Highway 88. (Photo: Sheri Smith)

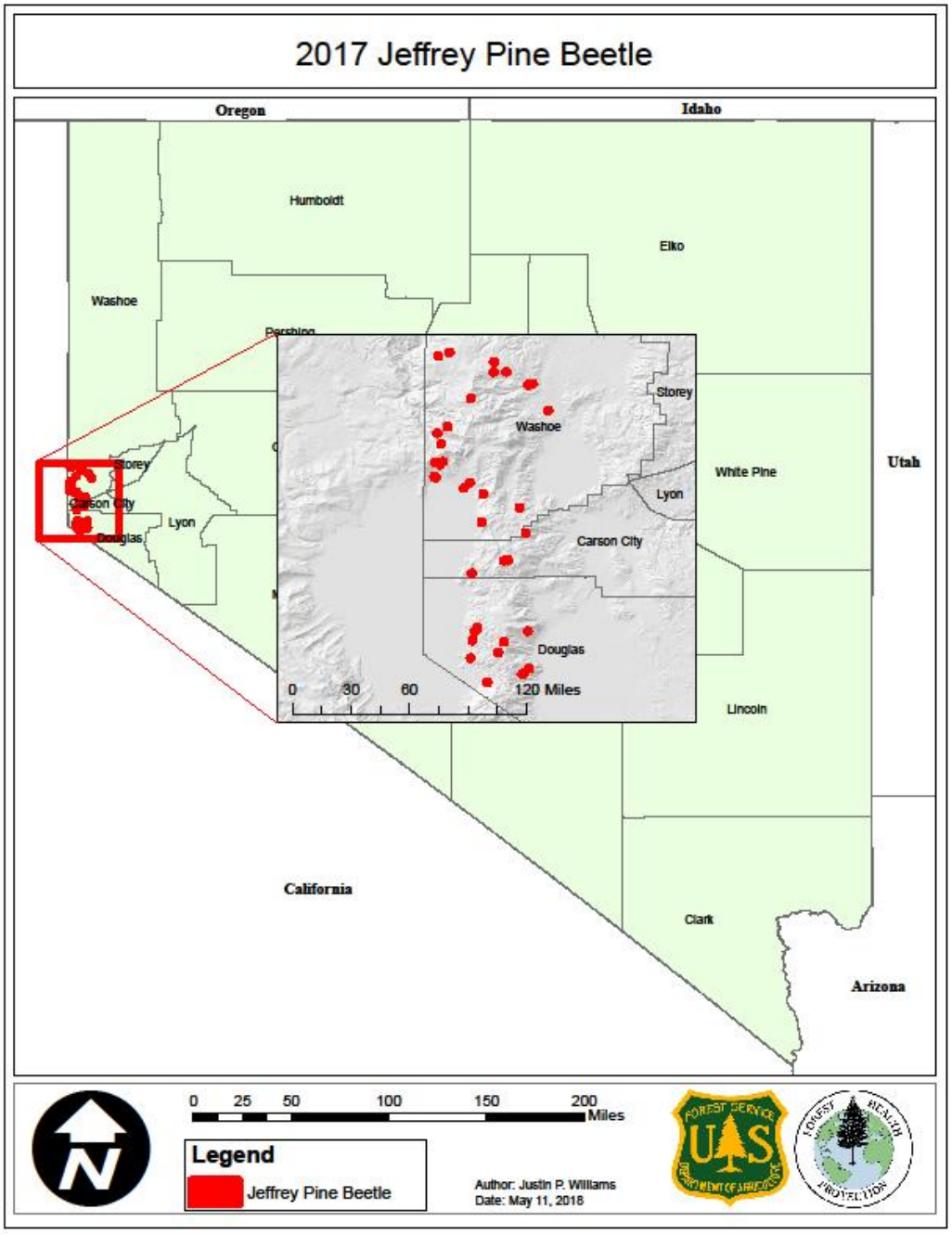


Figure 10 – Jeffrey Pine Beetle mortality in 2017 in western Nevada.

Carson County – Mortality was observed on 8 acres mainly located in the headwaters of Clear Creek, and north or Spooner Summit north of state Highway 50.
Douglas County – Mortality was observed on 50 acres located within the Carson Range within the county.
Washoe County – Mapped mortality, in 2017, decreased 58 acres compared to 588 acres in 2016. Mapped activity is found in large pockets northwest of Incline Village. Additional scattered pockets are found on the east shore of Lake Tahoe.

Mountain Pine Beetle
Dendroctonus ponderosae

Hosts: whitebark, limber, lodgepole, sugar, and ponderosa pine

Mountain pine beetle (MPB) can kill thousands of trees per year during outbreak conditions and millions of trees during extended epidemics in western forests. At endemic levels, MPB favors weakened, less vigorous trees with adequate phloem thickness to complete its life cycle. During epidemics, beetles may attack smaller diameter trees down to 4 inches diameter at breast height. Extensive mortality may alter large forest landscapes by converting pine forest ecosystems to grass and shrub landscapes for a period of 10-20 years. This conversion affects wildlife habitat, water yields and fuel loading.

In 2017, MPB-caused tree mortality in Nevada increased in all species with the biggest increases in whitebark and limber pine. Mortality increased by 143% with a total of 2,327 acres mapped as compared to 955 acres mapped in 2016. Most of the 2016 Nevada mortality occurred in Clark, Elko, Nye, Washoe, and White Pine counties.

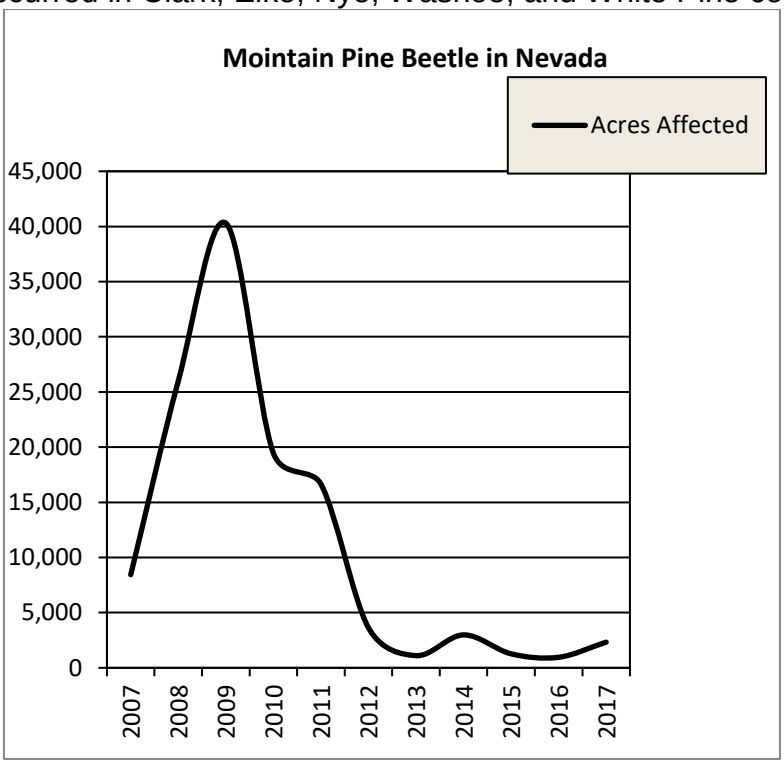


Figure 11 - Number of whitebark, limber, western white, and lodgepole pine acres affected by mountain pine beetle in Nevada from 2007-2017.

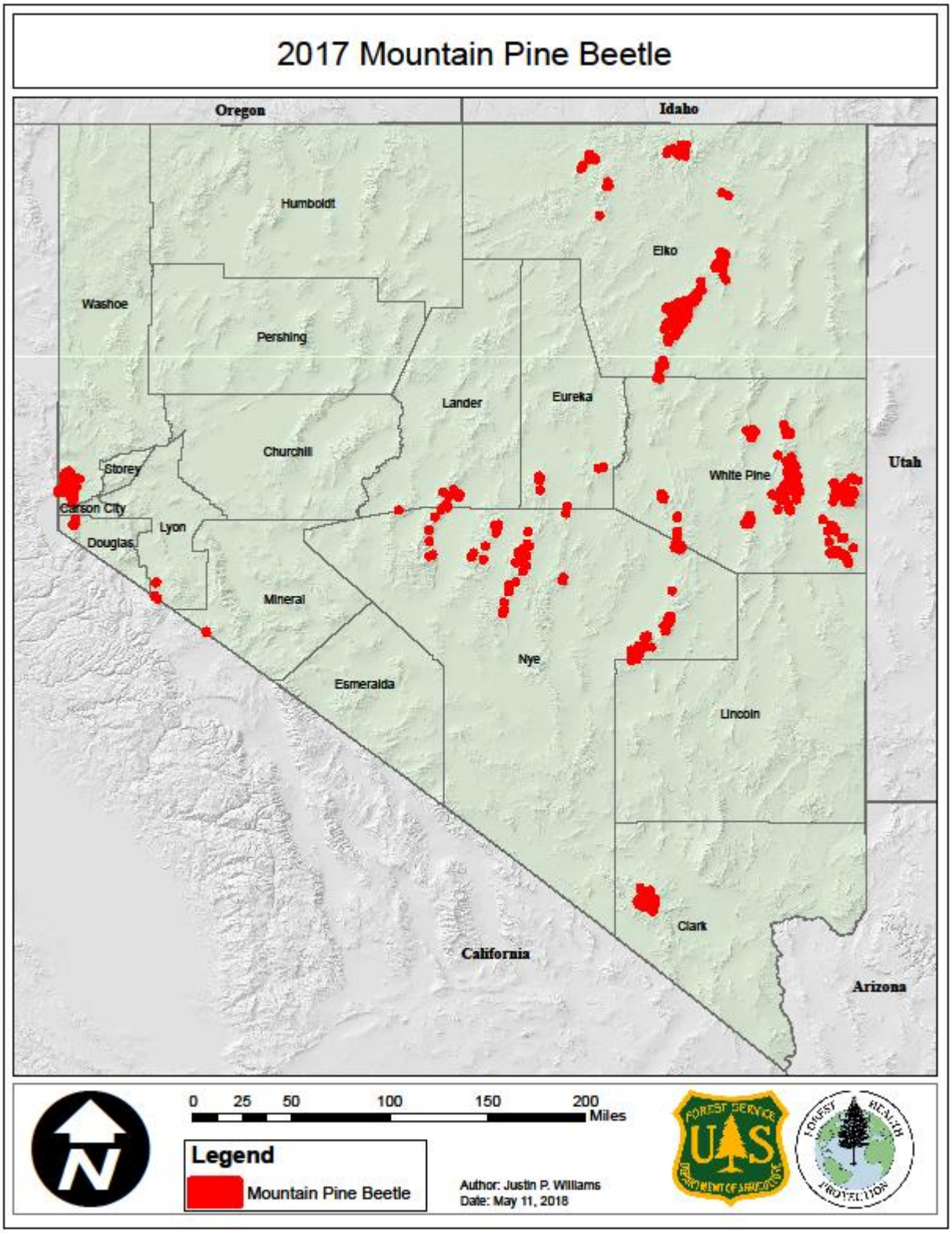


Figure 12 – Mountain pine beetle caused tree mortality in 2017.

Mountain Pine Beetle – Lodgepole, Limber, Whitebark, and Western white pine

Clark County – Surveyors mapped 98 acres of MPB killed whitebark and limber pine trees, all within the Spring Mountain National Recreation Area.
Doulgas County – Surveyors mapped 17 acres of MPB killed lodgepole, limber, and western white pine, all within the Carson Range south of Highway 50.
Elko County – Surveyors mapped 755 acres of MPB killed whitebark and limber pine trees, and 36 acres of lodgepole pine trees. The majority of this mortality occurred in the Ruby and Jarbridge Mountain Ranges.
Nye County – Surveyors mapped 309 acres of MPB killed limber and whitebark pine trees. Mortality was also recorded on 8 acres of ponderosa pine trees. Damage was located in the Hot Creek, Monitor, and Toiyabe Mountain Ranges.
Washoe County – Surveyors mapped 262 acres of MPB killed western white, whitebark, and limber pine trees in 2017. This is a 187% increase from 2016 which only mapped 91 acres. The 2017 also mapped 47 acres of MPB killed lodgepole pine in small group kills of 1 – 2 acres. This damage was surveyed throughout the higher elevations of the Carson Range, mostly northwest of Mount Rose.
White Pine County – Surveyors mapped 691 acres of MPB killed limber and whitebark pine trees. An additional 3 acres of MPB killed bristlecone pine trees was recorded in the Snake, and Schell Creek Ranges. This is significant since MPB killed trees for this species has not been recorded for several years, and any mortality is considered significant for this tree species.

Mountain Pine Beetle in trapping Lodgepole Pine

The Nevada Division of Forestry continues its trapping program Clark, Elko, and Washoe County. Below is the trapping data from Mt. Rose for 2017.

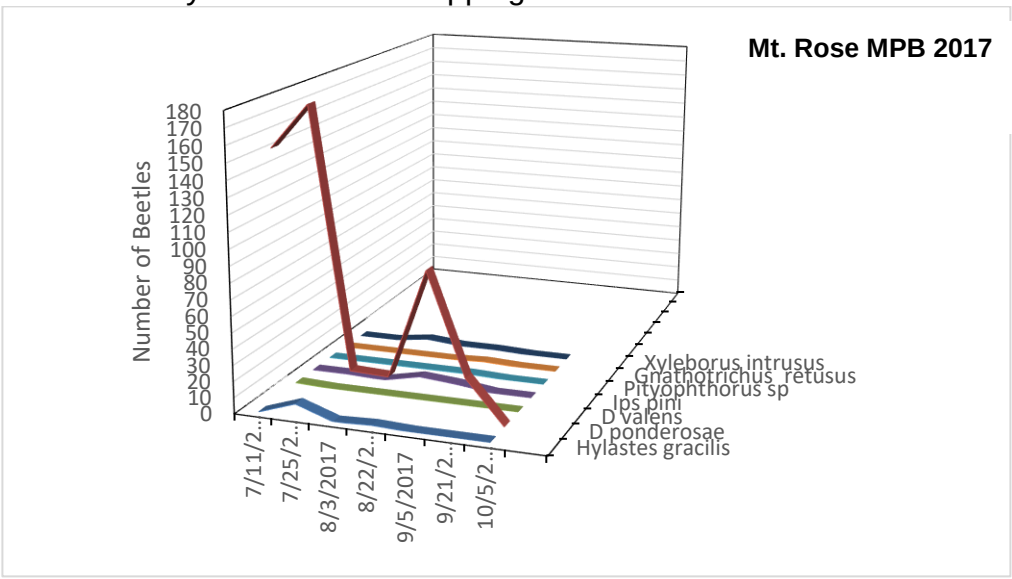


Figure 13 - Mt Rose Ski Area MPB trap catch data for summer 2017 with peak MPB catches from mid-July, mid-September, which covered 2 flights during the season. However, there are secondary beetle being trapped which can indicate increased bark beetle activity.

Western Pine Beetle (WPB) in Ponderosa Pine

In 2017, ponderosa pine mortality was attributed to western pine beetle in five counties within the state of Nevada. See Figure 14 for trapping data.

Clark County – In 2017, there were WPB-killed ponderosa pine trees mapped on 196 acres in Clark County. This is a moderate increase in WPB damage and activity. Damage decreased from 58 acres in 2016 to 196 acres in 2017. The majority of the WPB damage is along the Kyle Canyon corridor along Highway 157 where salt damage is occurring from winter time road salting thus stressing the ponderosa pine within the road right-of-way. Additional damage was observed between the Kyle and Lee Canyons, scattered in pockets of 3 acres or less. Below is a graph showing the results from trapping in Kyle Canyon for various bark beetles. Monitoring will be installed for the 2018 field season to monitor any changes in beetle populations. Other Counties – The remainder of the state's counties accounted for only 8 more acres and was very scattered. Douglas, Mineral, Nye & Washoe County observed 2 acres for each county.

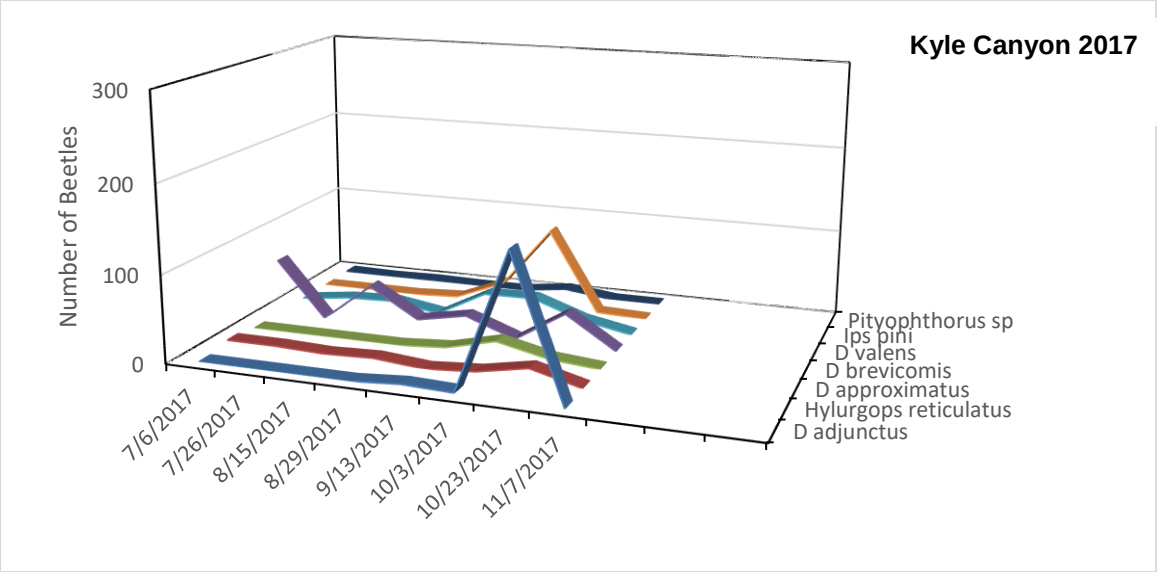


Figure 14 – Kyle Canyon trap catches summer of 2017 showing the dominance of D. brevicomis in mid-summer through early fall. This data is mainly to track secondary beetles which can indicate increased bark beetle activity.

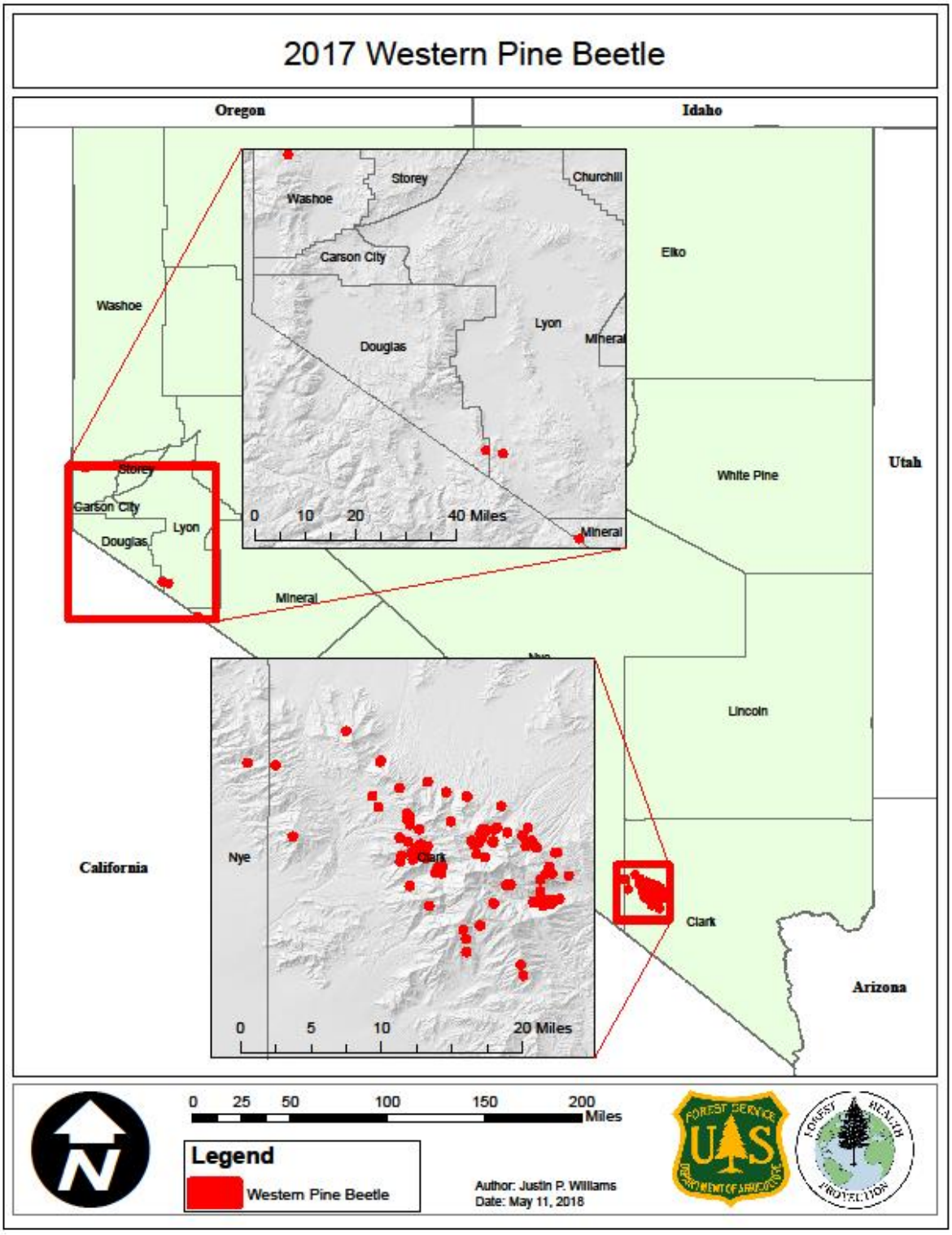


Figure 15 – Western Pine Beetle Damage in Nevada, 2017

Pinyon Engraver Beetle / Pinyon *Ips*

Ips confusus

Host: single leaf pinyon

The pinyon engraver beetle (PEB) is a pest in pinyon-juniper ecosystems often affecting valuable home landscape trees. The insect produces multiple generations each year and consequently populations can build and spread rapidly.

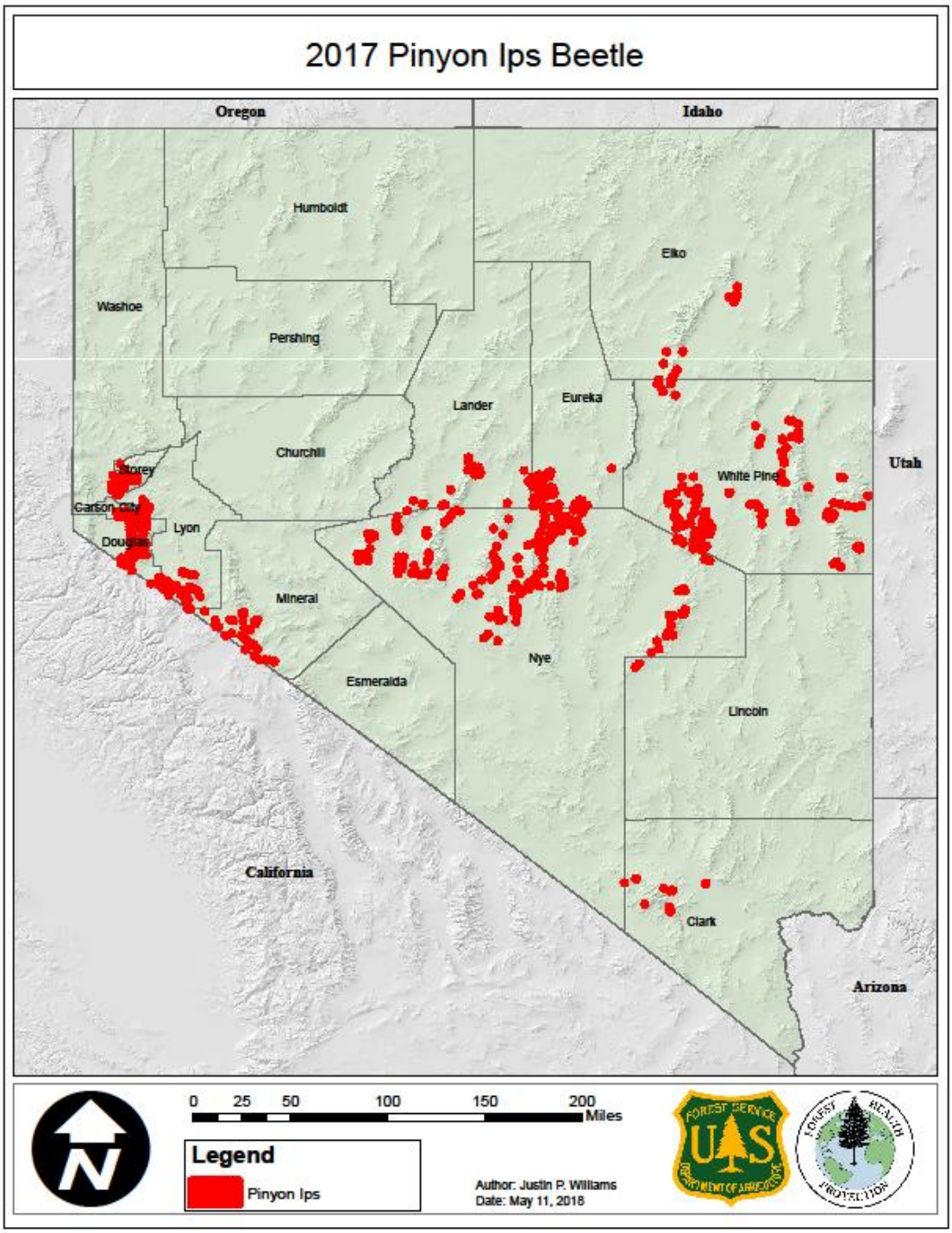


Figure 16 – Tree mortality caused by the pinyon engraver beetle in 2017 in Nevada.

In 2017, recorded mortality increased to 2,314 acres mapped as compared to 1,632 acres in 2016. This is a 41% increase, however it is very slight statewide (Figure 16). In 2017, thirteen counties had recorded mortality from pinyon *Ips*. Nye and White pine counties had the greatest number acres recorded in aerial surveys which represents 64% of the state total.

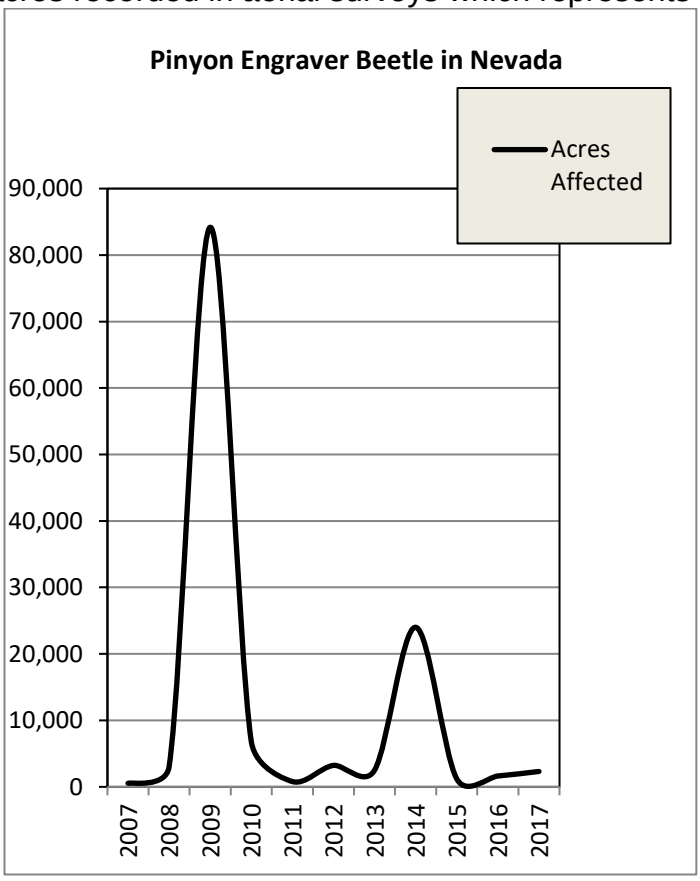


Figure 17 - Number of pinyon pine acres affected by pinyon engraver beetle in Nevada and from 2007-2017.

Carson City County – In 2017, surveyor's mapped pinyon *Ips*-killed pinyon pines on 20 acres.

Clark County – Surveyors detected pinyon *Ips*-killed pinyon pine trees on 30 acres located on the northeast aspects at lower elevations on the Spring Mountains.

Douglas County – In 2017, surveyor's mapped 183 acres pinyon *Ips*-killed pinyon pines as compared to 163 acres mapped in 2016. This represents a small increase in mapped tree mortality. Damage is located in many scattered spots throughout the Pine Nut Mountain Range and north of Holbrook Junction.

Elko County – In 2016, surveyor's mapped pinyon *Ips*-killed pinyon pines on 67 on the far north end of the Ruby Mountains at lower elevations.

Eureka County - In 2017, surveyor's mapped pinyon *Ips*-killed pinyon pines on 134 acres. The majority of the mapped mortality was immediately south and east of the town of Eureka, Nevada.
Lander County – In 2017 surveyors mapped mortality on 52 acres. Damage is found in scattered pockets in the northwest Shoshones, and northern Toquima Ranges.
Lincoln County - In 2017, surveyor's mapped pinyon *Ips*-killed pinyon pines which was widely scattered on only 4 acres.
Lyon County –The number of detected pinyon *Ips*-killed pinyon pine was mapped on 148 acres. This is a slight increase from 2016 where 103 acres were mapped. Mortality was identified in southern end of the Pine Nut Mountains.
Mineral County – In 2017, surveyor's mapped pinyon Ips-killed pinyon pine trees on 78 acres. Mortality is primarily located in the Excelsior Mountains
Nye County – Surveyors mapped pinyon *Ips*-killed mortality on 607 acres as compared to 761 acres mapped in 2016. This is a minor decrease from the previous year. Damage was identified in scattered pockets in the Grant, Hot Creek, Monitor, Toquima, southern Toiyabe Mountain Ranges.
Storey County – In 2017, surveyor's mapped pinyon *Ips*-killed pinyon pines on 76 acres. All the mortality was located in the Virginia Highlands.
Washoe County – In 2017 damage continued to be very light where pinyon *Ips*-killed pinyon pine trees were mapped on only 29 acres.
White Pine County – In 2017, pinyon *Ips*-killed pinyon pines were mapped on 885 acres. This is a large increase when compared to 2016 where only 33 acres were mapped. Much of the mortality was associated with older pinyon needle scale in the eastern White Pine Range. Mortality was also observed in scattered pockets on the White Pine Range and in larger 1-2 acre pockets in the Egan, and Snake Mountain Ranges.

Pitch Mass Borer
Dioryctria spp.

Hosts: Singleleaf pinyon, ponderosa pine, Jeffrey pine

In the larval stage, *Dioryctria spp.* bore into the cambium of the trunk, branches, and shoots. This borer kills lateral branches and treetops of singleleaf pinyon and Jeffrey pine. With prolonged drought, this injury has weakened pinyon trees sufficiently to allow pinyon engraver beetle to successfully attack and kill pinyon pine trees. Pitch mass borer is found throughout the state of Nevada in most counties with singleleaf pinyon. The heaviest concentrations seem to occur in western Nevada where it also affects Jeffrey and ponderosa pine. Many young Jeffrey pines on the east slope of the Carson Range that came in after fires have been affected by this insect. In 2006 several entomologists, pathologists and foresters conducted a pinyon blister rust (*Cronartium occidentale)* search through the central portion of Nevada. They noted that pitch mass borer frequently uses rust cankers as an entry point (Figure 17). The rust and borer are found extensively across the state but are not mapped by ADS.


Figure 18 - Pitch mass borer infesting pinyon pine infected with pinyon blister rust.

INSECTS: NON-NATIVE

White Satin Moth
Leucoma salicis (L.)

Hosts: aspen, willows, cottonwoods, and other deciduous species

The white satin moth (WSM) is a non-native defoliator of aspen in the family of tussock moths (*Lymantriidae*). WSM is native to Europe and Asia. This is the same family gypsy moth and Douglas fir tussock moth are found in. It was introduced into North America in British Columbia in 1920. It is currently distributed from Newfoundland through eastern Canada, northeastern US and from BC to northern California and in 2004 found in southwest Wyoming. It is now been found throughout Northern Nevada. Overwintering takes place as a second-instar larvae which seek out hibernation sites on the trunk or branches of a host tree and molt after spinning silken coverings (hibernacula) which are hard to see because they are covered with bark, mosses and other detritus. When they emerge in May they feed on the young new leaves. This feeding continues until late June to early July and the larvae go through five to 6 more instars until they are approximately 3.5 – 4.5 cm long.. The caterpillar (the most often seen life stage) is mostly grayish brown with a dark head and back, but what stands out is the one row of large oblong white to pale-yellow patches down the middle of the back and two yellow lines sub-dorsally. The two lateral and sub-dorsal rows of orange tubercles have tufts of long brown hairs attached. These larvae spin cocoons in the leaves to pupate into shiny black, 1.5 to 2.2 cm long pupae with tufts of yellow hair. In July and August the adult moths emerge. The white adult moth about 2 - 4 cm long have no

markings on the wings; the bodies are black and covered with white silky hairs that only allow glimpses of black beneath. See Figure 18 photos below:

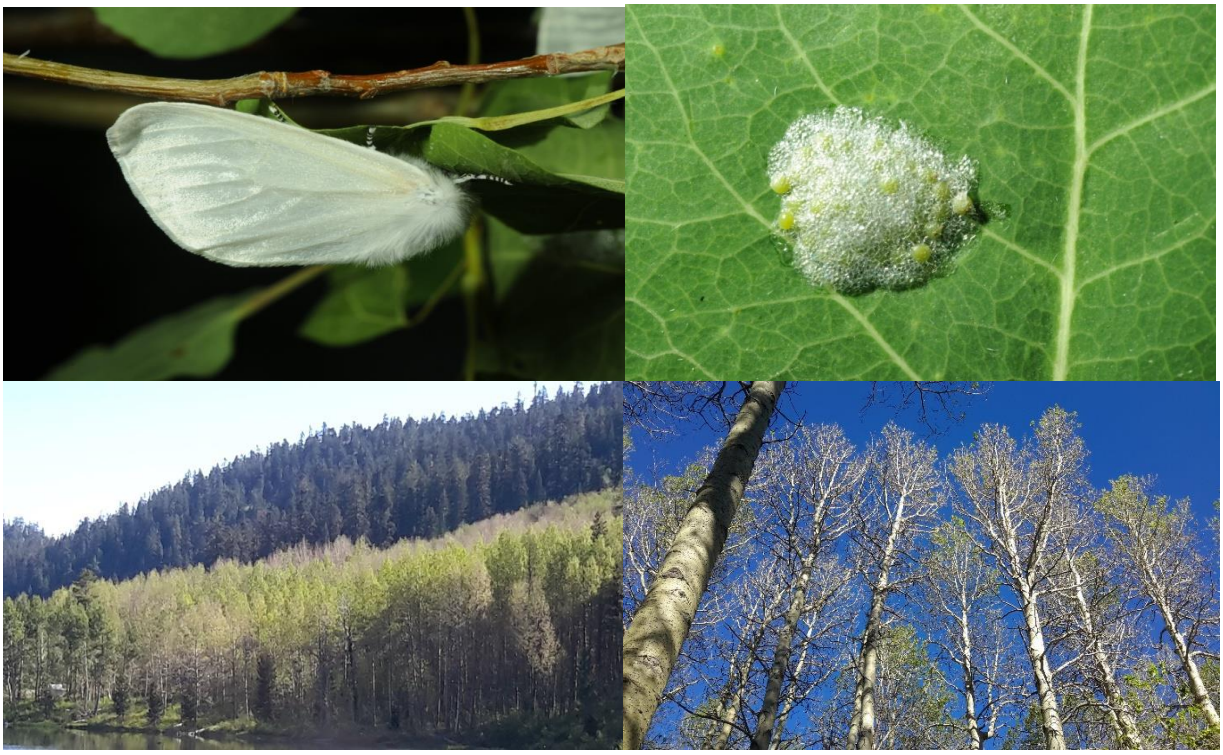


Figure 19 – Female White satin moth (top left); egg mass (top right); Marlette Lake Damage(bottom left); 75% defoliation (bottom right) Nevada Lake Tahoe State Park, August, 2017 (Photos-Gene Phillips)

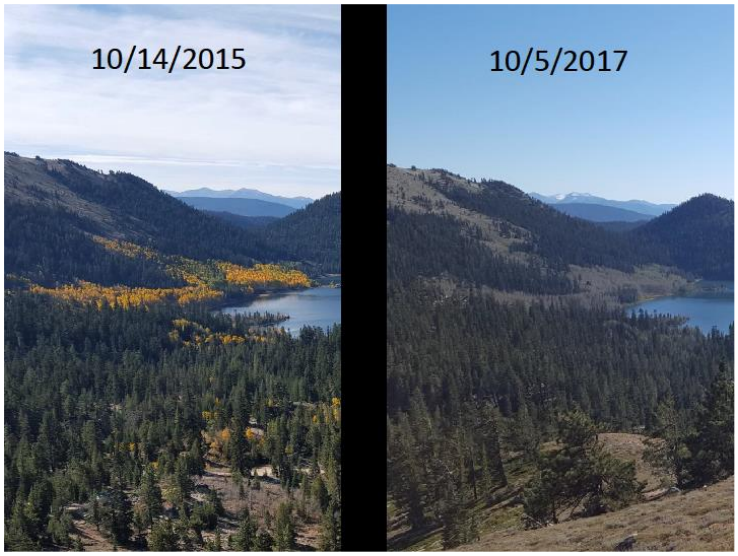


Figure 20 – Damage Comparison 2015 vs. 2017. Note there is no fall color.

In 2017, a sharp increase in defoliation was observed in the Lake Tahoe Basin. Approximately 226 acres of heavy defoliation of greater than 30% was observed in Nevada Lake Tahoe State Park. Defoliation was observed in North Canyon, Marlette and Hobart Lakes. This area is north of Spooner Summit and Highway 50. Damage was also recorded on adjacent Humboldt Toiyabe National Forest Land as well. This infestation has been present since 2011, however this was highest increase in population and defoliation. Approximately 50 acres in this area had 75% defoliation with some limited mortality. Statewide 350 acres were observed being defoliated in Carson City, Douglas, Humboldt, and Washoe Counties. The NDF Forest Health Specialist has increased monitoring reports, and is coordinating statewide efforts for trapping, and a possible control project.

European Gypsy Moth
Lymantria dispar

Hosts: various deciduous species

In 2017, gypsy moth was surveyed by Nevada Department of Agriculture (NDOA). Trapping was conducted from May to September. In all 235 traps were placed in 17 counties; all traps were negative. The last identified adult male was discovered in an RV park in Winnemucca in 1999. No moths were trapped in 2017.

Figure 21 - Adult gypsy moths; female above; male below, Photo: USDA APHIS PPQ archive, www.bugwood.org.

Red palm weevil
Rhynchophorus ferrugineus

Hosts: various palm tree species

Red palm weevil (*Rhynchophorus ferrugineus*), South American weevil (*Rhynchophorus palmarum*), and Silky cane weevil (*Metamasius hemopterus*) were surveyed for using a modified bucket trap baited with pheromone and fermenting fruit. In all, 120 traps were placed in Clark County and southern Nye County. All traps were negative.

Exotic Wood Borers including: Scolytinae/Sirex Wood Wasp (Sirex noctillo), Asian Longhorn Beetle (Anoplophora glabripennis), and Emerald Ash Borer Beetle (Agrilus planipennis)

Hosts: various species

In 2017, the Nevada Department of Agriculture NDOA conducted funnel trapping for exotic wood borers using EDRR style trapping methods and sites (20 traps total) surveyed in 4 counties. All traps were negative. Emerald Ash Borer (*Agrilus planipennis*) trapping and data collection was performed in the Las Vegas and Reno areas. Trapping was conducted with traps located in 4 counties and all traps were negative.

Mediterranean Pine Engraver
Orthotomicus erosus

Hosts: Pinyon pine. Aleppo Pine

This is a new non-native species identified by the Nevada Department of Agriculture entomologist Jeff Knight in the fall of 2015. This species was identified in pinyon pine west of Las Vegas, in the Blue Diamond area. The Mediterranean Pine Engraver is established though out the Las Vegas area, with reports on Overton, NV area as well to the south neat the state line with California. Populations at this time appear to be scattered and generally very light. The beetle does not appear to be the cause of the reported problems on pines in the area. Several specimens were submitted for identification to the NDA. The NDA is developing information on this species and its possible effects and damage to conifer species in Nevada.

Stem and Branch Diseases

Dwarf Mistletoes
Arceuthobium spp.

Hosts: Douglas-fir, pines, true firs, and single-leaf pinyon

Dwarf mistletoes (DMT) are the single-most damaging agents of coniferous trees. These parasitic plants remain the most widespread and frequently observed disease within the state. Profusely branched, dense masses of host branches called “witches brooms” are often observed. Dwarf mistletoe infests trees of all ages, and infection may exist in secondary growth and regeneration, as well as mature and over mature tree stands. Dwarf mistletoes spread fastest and are most problematic when an infected overstory exists over new regeneration. Severe dwarf mistletoe infestation can:

- Predispose trees to attack by insects and other diseases,
- Reduce incremental growth,

- Affect the forest canopy structure,
- Lower resistance to drought,
- Affect production of seed,

Conversely, dwarf mistletoes may be beneficial to wildlife habitat in some cases, depending on the type of wildlife habitat desired.

Pinyon engraver beetle-caused mortality was observed in some of the heavy dwarf mistletoe infected pinyon pine stands around the state of Nevada. Dwarf mistletoe continues to cause weakened lodgepole and ponderosa pine trees to succumb to bark beetle attacks as well.

Currently, fuel reduction activities are being undertaken in heavily DMT infested stands of pinyon pine in western Nevada. The treatments are intended to create a buffer between non-infected stands and infected stands to prevent the spread of this disease. This type of treatment can be effective, due to the primarily short range spread mechanism of dwarf mistletoes.

Ponderosa and Jeffrey pines are often found heavily infected with western dwarf mistletoe (*A. campylopodum*) and then are attacked by *Ips*, flathead borers, Jeffrey pine beetle, and western pine beetle as well as other agents, especially during prolonged drought periods. Additionally, true fir trees infected with dwarf mistletoe are commonly attacked by fir engraver beetle, or experience branch dieback due to *Cytospora* canker. Limber pine dwarf mistletoe (*A. cyanocarpum*) was found infecting whitebark and limber pines on the East Humboldt and Ruby Mountains predisposing them to attack by mountain pine beetle in those areas

Figure 22 – A. cyanocarpum infecting whitebark pine in Lamoille Canyon in the Ruby Mountains and on limber pine at Angel Lake in the East Humboldts. These trees were subsequently killed by mountain pine beetle.

Pinyon Blister Rust
Cronartium occidentale

Host: singleleaf pinyon pine

An informal survey of central Nevada by various FS pathologists and entomologists as well as BLM and Nevada State Foresters revealed that the disease is common throughout the state. It attacks and kills small trees (Figure 21) and causes branch flagging on larger more trees. Many of the rust infections were attacked by pitch mass borer. This disease is mainly found in a band between 6000 and 7000 feet of elevation near drainages that are suitable for the alternate host (*Ribes* spp.).

Figure 23- Single leaf pinyon pine infected with pinyon blister rust near its base.

White Pine Blister Rust
Cronartium ribicola

Hosts: limber, bristlecone, whitebark, sugar, and western white pine

White pine blister rust (WPBR) has been observed in western Nevada on the east side of the Sierra Nevada Mountains in sugar, whitebark and western white pines. The rust has expanded its range in Nevada in recent years, with populations of rust now confirmed in the Jarbidge Mountains. Continued WPBR infections have been identified in the Lake Tahoe Basin and most recently near Incline Village, Nevada near Crystal Bay. The NDF has purchased blister rust resistant seed from the Sugar Pine Foundation in order to grow blister rust resistant sugar pine. These seedlings can be used in reforestation efforts where natural regeneration is not occurring. This seedling growing effort has just begun so no results available at this time.

At this point in time the only confirmed population of white pine blister rust in eastern Nevada is in the Jarbidge Mountains. There is concern that WPBR could become established in sensitive populations of Great Basin bristlecone pine. In 2010, researchers initiated an effort to collect seed from Great Basin bristlecone to include this species into breeding efforts aimed at detecting resistance to WPBR in 5 needle pines. Additionally, seed from bristlecone in Great Basin National Park was collected in 2011. Seed collection began in 2014, along with disease resistance testing. Resistance trails that a quantitative is currently ongoing. Preliminary results are promising and suggests heritable genetic resistance exists in limber pine within the park. Research will be ongoing through 2022 and will provide deliverables about frequency and variation of resistance, seed collections form both species, identify rust resistant trees for future seed collection, and refinement of the resistance screening technology.

Figure 24 – White Pine Blister Rust in sugar Pine
Photo – Jeff Haas

Aerial surveys in 2017 indicated scattered mortality throughout the Lake Tahoe Basin. Approximately 26 acres were observed showing decline or mortality, with the majority being observed in Washoe, Carson, and Douglas Counties.

Sudden Oak Death
Phytophthora ramorum

Sudden Oak Death (SOD), an exotic forest disease caused by the pathogen *Phytophthora ramorum*, has been killing thousands of tanoak and oaks in the coastal areas of California, but has not been observed in Nevada. However, potentially infected nursery stock was released into all 50 states from a single California nursery, prompting NDOA officials to contract with the USFS to conduct surveys. Both forest areas and areas near nurseries were surveyed, but showed no SOD. SOD has been detected for all regions surveyed to date.

ROOT DISEASES

Annosum Root Disease
Heterobasidion irregulare
Heterobasidion occidentale

Hosts: Lodgepole pine, Jeffrey pine, ponderosa pine (*H. irregulare*), spruce, true firs, and incense cedar (*H. occidentale*)

H. occidentale can be found throughout the state on true firs, but it frequently acts as butt decay or as a saprophyte on dead trees, stumps, roots, and cull logs or fallen stems. *H. irregulare* can be found in mature pine trees on the east side of the Sierras and the fungus can kill young ponderosa pine, especially in plantations on droughty soils. Symptomatic small trees can frequently be found around infected stumps with butt decay. The symptoms on larger trees include a thinning crown, decay in the root system and fruiting bodies that develop at the base of the tree or inside stumps.

Figure 25 – Conk at base of tree

Armillaria Root Disease
Armillaria spp.

Hosts: All trees

Evidence of Armillaria root disease can be found throughout the state causing mortality in all species of trees. This disease also frequently functions as a weak pathogen or saprophyte. Fruiting bodies grow in clusters from the roots or at the base of the tree during moist conditions. There is a close association between root disease pockets and endemic level bark beetle populations.

Figure 26 - Armillaria mushrooms, photo: Gail Durham

Black Stain Root Disease
Ophiostoma wageneri

Hosts: pinyon pine, ponderosa pine, Jeffrey pine and Douglas-fir

Figure 27 - Black stain root disease. Photo-Donald Owen

Black stain root disease is an important disease of several hosts. It is found mainly in pinyon pine, but it can infest both Jeffery and ponderosa pine which has been found in small areas of the eastern Carson Range. It usually kills affected trees within a few years, and it can produce groups of mortality that are several acres in size. Pockets of infected trees are preferred host for low-level populations of pinyon engraver beetles. No new pockets of black stain root disease were observed by aerial survey in 2017.

Cytospora Canker
Cytospora spp.

Host: aspen

Cytospora canker is one of the most common diseases affecting aspen in ornamental situations and often attacks stressed trees through wounds. This fungus girdles branches by killing the cambium. Large, vigorous trees can withstand the disease and are rarely killed. Activity from this pathogen is most likely a symptom of several years of water stress or defoliation from other insects or diseases. From the air, decline due to Cytospora canker can look similar to decline by forest tent caterpillar defoliation.

LEAF AND NEEDLE DISEASES

Aspen Leaf Spot
Marssonina populi

Host: Aspen

Blight and leaf spot caused by this disease have been seen in the past throughout the host type. In late June through early July, Nevada received heavy amounts of precipitation which caused a significant amount of blight and leaf spot by late summer.

Figure 28 - Symptoms of aspen leaf spot disease.

Approximately 3,083 acres were surveyed as Marssonina blight, and unknown Aspen defoliation. Elko County had 2,165 acres surveyed. Nye, Lander, and White Pine County had 452 acres, 25 acres and 253 acres surveyed respectively. The majority of the damage included heavy blight and leaf spot causing noticeable leaf discoloration and dieback. Fall color was impacted with trees losing their leaves early or not showing much fall color at all. Since these leaf diseases are cyclical and weather dependent it is not anticipated to be a long term problem.

DECLINES / COMPLEXES

Subalpine Fir Mortality Complex

Host: Subalpine fir

The western balsam bark beetle (WBBB) is the most significant mortality agent in a complex of forest insects and disease causing subalpine fir mortality. Endemic populations will occur in storm-damaged trees, slash, or trees of poor vigor. WBBB infestations may build to epidemic levels, where mortality can occur in groups of 100 to 10,000 trees. Annosum root disease, woodborers and several species of smaller bark beetles are also involved in this complex. Environmental stress due to drought or overcrowding may also have a role in the death of trees in this category.

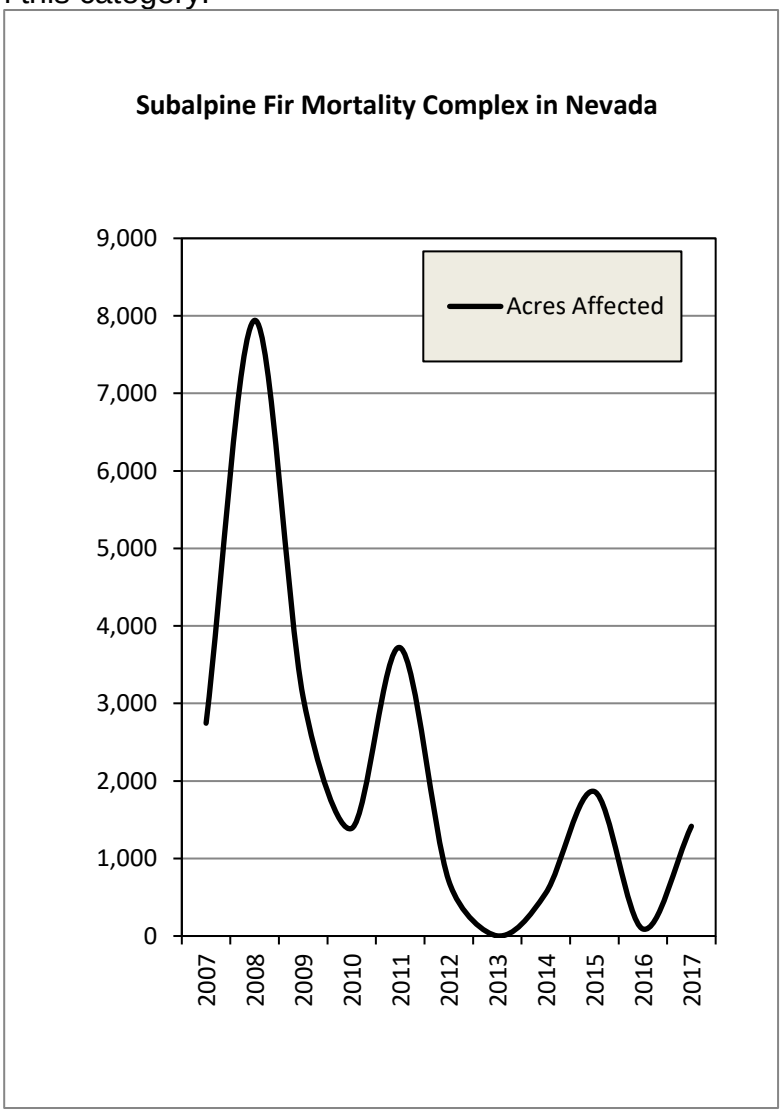


Figure 29 - Subalpine fir mortality complex 2007 - 2017

In 2017, mortality attributed to subalpine fir mortality complex increased from very small pockets of 2 acres up to pockets that exceeded 50 acres. All damaged mapped in the 2017 ADS is located in Elko County.

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Elko County – Small to larger sized continuous areas were identified with some areas exceeding 50 acres. All recorded damage was located in the Jarbridge Mountains and totaled approximately 1,416 acres.

Aspen Decline/Dieback
Host: Aspen

A decrease in the amount of aspen forest acreage has been reported throughout the western U.S. for many years. The primary factors involved are succession of aspen forest to other vegetation types due to fire exclusion, and damage to young aspen sprouts by grazing animals. This phenomenon has been labeled “aspen decline” by some authors. This type of “decline” should be distinguished from the aspen dieback that has been detected in aerial survey that is caused by several agents including drought stress, insects, diseases and other stresses. This dieback can impact aspen clones that have been impacted by fire exclusion and grazing pressure causing them to decline and die.

In 2004, Intermountain Region FHP examined what had been mapped as insect defoliator damage or Cytospora canker in several areas in north-central Nevada and discovered that a number of insect and disease agents were involved. Research across North America has revealed mostly canker diseases and insect borers are causing the decline in which drought stress is the largest contributing factor to decline and dieback. In 2017, surveyors mapped approximately 3,083 acres.

Douglas County – In 2017, 22 acres were observed mainly in the Carson Range
Elko County – In 2017 there was 2,165 acres of detectable aspen decline/dieback. This located mainly in the Jarbridge and Ruby Mountains.
Eureka County –Scattered pockets were observed on 8 acres.
Lander County –Very isolated pockets of damage were observed on only 19 acres.
Mineral County – In 2017 surveyors mapped 75 acres of affected stands in scattered pockets.
Nye County – In 2017, surveyors detected 452 acres of aspen decline/dieback in Nye County. Dieback is found in continuous pockets in the southern Monitor, Toquima and Hot Creek Ranges.

Washoe County – In 2017, surveyors observed damage on 85 acres. This was located mainly in the Mt. rose Wilderness, north of Highway 431.
White Pine County – In 2017, surveyors mapped approximately 253 acres of affected stands, in scattered pockets of less than 20 acres. This was located mainly in the Schell and White Pine Ranges, and in scattered areas within Great Basin National Park.

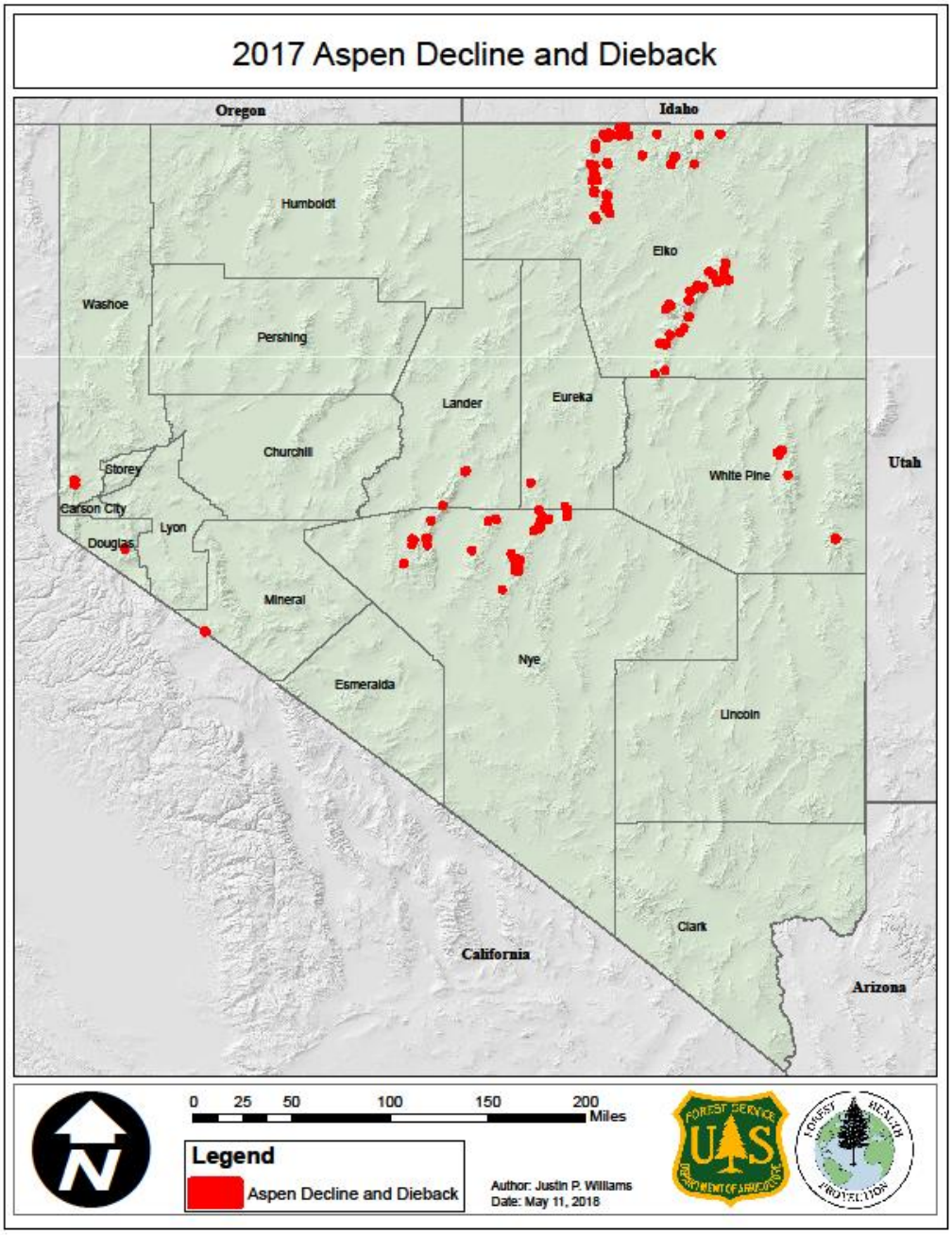

Figure 30 – Dieback & Decline of Aspen in Nevada 2017

ABIOTIC DAMAGE

Wind damage / Blowdown

Areas of concentrated, high velocity winds can cause trees to blow over. Blowdown occurs in groups or as scattered trees within the landscape. Depending on the tree species, patches of blowdown in coniferous forests can provide a food source for various bark beetles, enabling populations to build to epidemic levels. These epidemic populations may then attack and kill standing, live trees adjacent to the blowdown. No significant blowdown was mapped in Nevada in 2017.

Wildfire Damage

In 2017, wildfire damage increased significantly, however the majority of the damage was found in sagebrush ecosystems. Approximately 1,329, 289 acres were burned statewide across all ownerships, and of that, approximately 25% burned in pinyon juniper woodlands. There was minor damage to mixed conifer and aspen timber resources within the state. Wildfire damage to mixed conifer stands occurred mainly on lands administered by the USFS Humboldt Toiyabe National Forest.

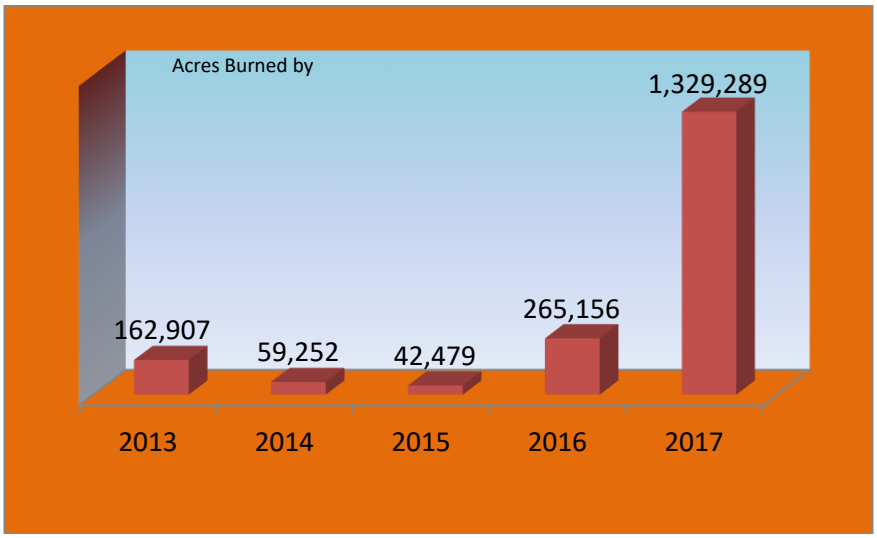

Figure 31. Wildfire damage 2013 - 2017

Unknown and Frost Damage

Hosts: aspen, willows, cottonwoods, and other deciduous species

Approximately 30 acres of frost damaged aspen was aerially mapped throughout northern Nevada in 2017. The major area of damage was on the northeast flanks of Mt. Rose. There was a very late frost with snow in early June of 2017 where trees had already leaf out. This caused a major leaf drop at this time. Aspen trees leafed out again later in the summer, however they had a very ragged and incomplete crown. Approximately 2,543 acres of unknown damage was mapped throughout Elko, Nye, and White Pine County. These areas are located in very inaccessible terrain so damage was not verified and is listed as unknown.

Appendix A.

Noxious weeds are a continuing problem for all Western states. They have the ability to colonize disturbed habitats, aggressively displacing native plant species and altering ecosystems. Several state and federal agencies have the responsibility for monitoring and controlling noxious weeds. Our intention by including this information is to increase awareness of these potential problems. Table 3 at the beginning of this document is the list of plants declared noxious weeds by the State of Nevada for specific counties. The NDOA in coordination with the Nevada Department of Conservation and Natural Resources' Natural Heritage Database tracks weed populations throughout the state. For up-to-date information on Nevada Noxious Weeds and the three-tier State List go to:

http://www.agri.nv.gov/PLANT_NoxWeeds_index.htm

http://www.invasivespecies.gov
This website is the gateway to federal and state efforts concerning invasive species. There are links to numerous invasive species databases. This website should be one of your first stops.

http://www.agri.nv.gov/PLANT_NoxWeeds_index.htm
This website contains any information you need about noxious weed prevention, control and management for all land managers in the state of Nevada.

http://www.cdfa.ca.gov/phpps/ipc/encyclowedia/encyclowedia_hp.htm
California Department of Food and Agriculture has a very comprehensive website. Information includes: identification, biology, and management. Pictures of the plants in various stages are just a click away.

http://www.nwcb.wa.gov/index.htm
State of Washington's noxious weed control board website has information on black henbane, buffalo bur, camel thorn, Canada thistle, Dalmatian toadflax, dyer's woad, goatsrue, houndstongue, johnsongrass, jointed goatgrass, diffuse, Russian and spotted knapweed, leafy spurge, Mediterranean sage, musk thistle, perennial pepperweed, purple loosestrife, puncturevine, rush skeletonweed, silverleaf nightshade, scotch thistle, St. Johnswort, yellow nutsedge, purple and yellow starthistle, and velvetleaf. Topics include description, economic importance, geographic distribution, habitat, history, growth and development, reproduction, response to herbicides, response to cultural controls, and biocontrol potentials.

http://www.ipm.ucdavis.edu/PMG/selectnewpest.landscape.html#WEED
University of California pest management website has information on Bermuda grass, field bindweed, Russian thistle, yellow starthistle, and others. Topics include identification, biology, and management through cultural and chemical control options.

http://www.ext.colostate.edu/pubs/natres/pubnatr.html
Colorado State University Cooperative Extension website in the Range section has fact sheets on musk thistle, leafy spurge, Canada thistle, diffuse, Russian, and spotted knapweeds. Information includes description, phenology, and management options such as cultural, chemical, mechanical, and biological.

http://www.weedcenter.org
An interagency website housed at the Montana State University. The Center for Invasive Plant Management (CIPM) promotes the ecological management of invasive plants in the West through education, by facilitating collaboration among researchers, educators, and land managers, and by funding research projects and weed management areas. The center serves as an information clearinghouse, providing examples of ecological management, and delivering implementation tools and products to land managers. The center operates in partnership with federal, state, counties, private industry, universities, foundations, and landowners.

http://invader.dbs.umt.edu
The University of Montana's Invaders Database has a search engine that links the user to informational websites on most of the invasive weeds. You can search the database for the list of Noxious Weeds by state and most identified plants have additional information and links to more information.